



The No.1 Aquaponics magazine
for the backyard enthusiast.

Issue 9

Second Quarter 2010

Bringing Food Production Home

Backyard Aquaponics



The ups and downs of

Siphons

Interview with **Rick Mueller** at Growing Power

Slugs in the garden

Welcome

How time flies. Here in Perth winter has really set in, which means trout are the order of the day, and boy they are so much fun. Such voracious eaters, their one purpose in life is to eat and it's hard to think of a fish that could be more fun to grow in a system. Trout are always impressive and draw squeals of delight from customers here at our display centre when feed time comes around.

With this edition we've followed on with the theme of showcasing members systems from the online discussion forum. We have a look at Growing Power in Milwaukee, as Sylvia interviews Rick Mueller, the man who's responsible for the day to day operation and maintenance of Growing Powers Aquaponics systems.

Many people include a siphon as part of their aquaponic system design and in this edition I've started an in-depth look at different types of siphons, their positives and negatives and

the basic information about how they work. We then have a great article from Affnan explaining his modifications to a normal bell siphon. Affnan has become very well known in aquaponic circles for his ingenious simple modification that helps make the bell siphon more stable and reliable.



There's loads more in this edition, we carry on with Marks regular write up as he continues "Picking from the patch" in his backyard to feed his family. We also take a special look at Milne, most readers would know him by his forum name of "Food and Fish". Milne has been a regular of many aquaponics forums over the years and he's been a guiding light to those who are new to the concept. So, in this edition Faye pays tribute to Milne on behalf of all the people he's helped in aquaponics over the years. ●

Joel Malcolm, Editor

Aquaponic information resource

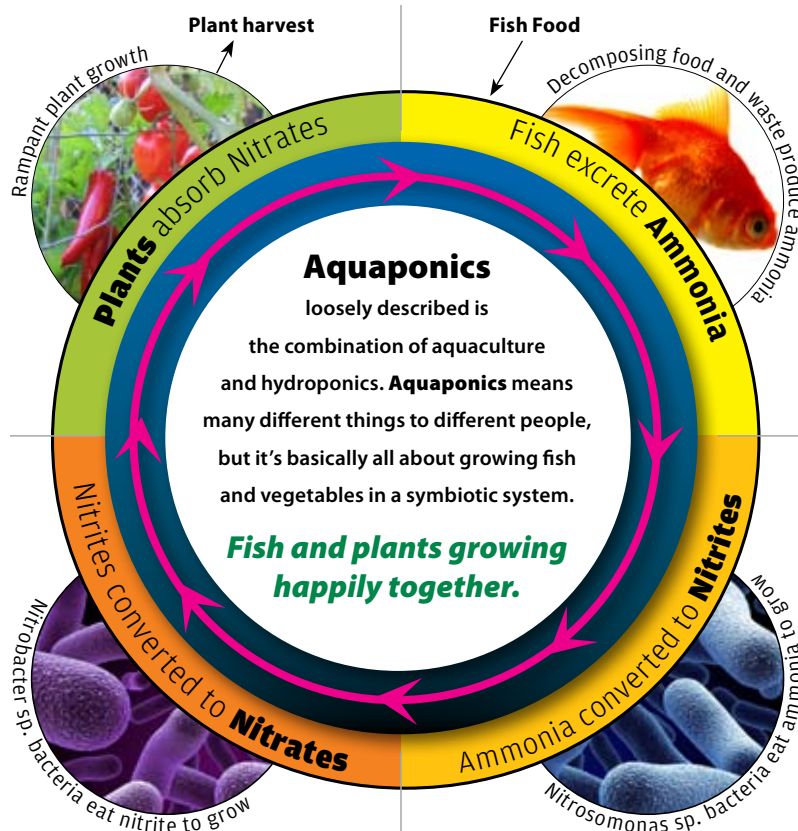
A wealth of new information has been added to the 'Information' section of the Backyard Aquaponics website recently.

- Firstly there is a 62 page report from Andrew S de Dezser titled "**COMMERCIAL INTEGRATED FARMING OF AQUACULTURE AND HORTICULTURE**", this report is the result of his recent trip through the US and Canada looking at aquaponics.
- Also from Caribbean Grower the second part of a report about aquaponics following the Masters Report. This 74 page document titled "**OPTIMIZATION OF A BACKYARD AQUAPONIC FOOD PRODUCTION SYSTEM**" by KEITH CONNOLLY and TATJANA TREBIC has a lot of in-depth information about aquaponics.

Have a look at the 'Information' tab at www.backyardaquaponics.com



The Nitrogen Cycle



Backyard Aquaponics



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Aquaponics

By **Steve Skalička**

The garden, for me was a place to escape the daily grind, with fruit and veggies being a bonus. And I didn't have to go very far



Lack of rain and the following water restrictions, were a good reason to install two smaller rainwater tanks. And then, thanks to Joel Malcolm; I came across an article about Backyard Aquaponics in the Organic Gardening magazine. What a brilliant idea!

Personally, I was never interested in hydroponics, and knew little about fish.

I just knew I had to put bait on the hook and hope for a bite - or buy them at the local fish markets.

It was new to me. And I hooked myself big time! Not being able to justify a big outlay for something I knew nothing about, I started with whatever I could find or scrounge locally. Over the three years my aquaponics system had three complete makeovers - growing a bit larger each time.

I also had one major disaster - losing a batch of silver perch and a few goldfish. A year ago, when in Sydney for a few days, the filters on the return pipes got partially blocked by a flash of water snails; that I had never seen before. Water overflowed

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perfection

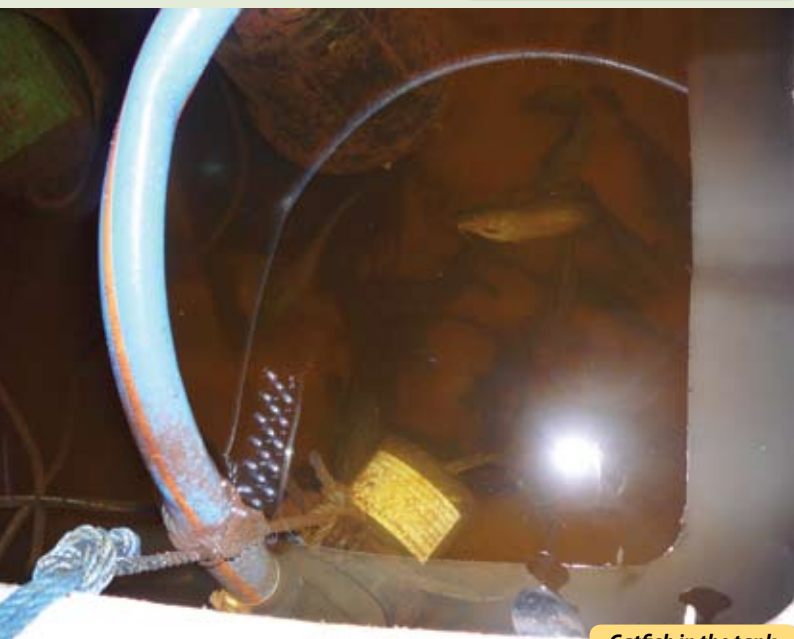
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Our Favourite Tanks



Air pumps with homemade mount



Catfish in the tank



Productive blue barrel growbed

on each siphon cycle from the filter box, until very little was left in the fish tank. Only two goldfish survived. On the last rebuild I discarded the filters and if the snails appear again, they will become fish food - hopefully.

The variety of fish and vegetable crops we can grow is climate dependent. Living in Melbourne's southeast suburbs, the summers here are quite dry, with temperatures occasionally reaching over 40°C, but winter temperatures are close to 0°C. So except for the trout, which I am yet to grow, we are limited to the slower growing indigenous fish.

I have had good results in growing lots of salad greens, silver beet, chard, sweet basil, coriander, beetroot and tomatoes. However, this year, the tomatoes were far from spectacular. One of the varieties I tried, Peron, is not the best tasting, and I will not plant it again.

I am yet to try capsicum and eggplants in aquaponics. One earlier attempt was unsuccessful, thanks to the aphids and mites. Due to the workload, I had little time to take proper care of them and pulled them out.

I have no problems with slugs or snails, perhaps because they do not like climbing high up and over scoria, but aphids, mites and the ravenous white cabbage moth caterpillars make me cringe. I have yet to try planting some repellent or sacrificial plants. Nor have I tried planting marigolds and dill, which I've heard attract the beneficial bugs.

After gradually replacing summer crops, the growbeds look rather empty. They're filled with radishes, broad beans, dwarf snap peas, salad greens and some recently germinated coriander and chard.

I am yet to taste home grown fish fillets. We lost the first batch of fish, and the second, 100 silver perch and the 50 tandanus catfish are not big enough for the frying pan. I was really surprised how resilient the silver perch and tandanus catfish are. There has been hardly any losses from this batch so far.

The current aquaponics setup consists of two IBC's used as fish tanks, each with six blue barrel halves, used as growbeds, and one 500 litre fish tank with four blue barrel halves, as the growbed.

Each fish tank has two pumps, and each pump supplies water to half of the growbeds. This halves the water fluctuation in

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the fish tank and protects against pump failures. The pumps are suspended about half way up in the fish tanks and switched on/off alternatively, by Picaxe based controllers.

A third pump, sitting on the bottom of each fish tank, is connected to a separate supply line to all the growbeds and is switched on manually when needed to suck up muck from the bottom of the fish tank. If a water change is needed, the extra fish tank pump can be connected to a hose to fill a row of

interconnected blue barrels that hold water for garden irrigation.

Each growbed is individually connected by a loop siphon and growbed overflow pipe to a 90 mm return pipe. The growbed overflow pipes are protected from possible blockage.

All three fish tanks are buried partially in the ground, to prevent runoffs or other contaminants getting in. Being in ground also reduces water temperature fluctuation. The growbeds are high enough aboveground to allow for reliable water siphoning and gravity-return to the fish tanks.

A fourth, smaller setup, consisting of a green barrel growbed and half barrel growbed is supported by two large goldfish. This is used mainly for cutting propagation and seed germination, but two herbs are running riot

in it as well. It can be used as a quarantine fish tank if needed.

The growbed for this setup is half filled with 9 mm red scoria and topped with finer quartz gravel, while all the other growbeds have the red scoria as a growing medium.

Air is supplied to the fish tanks by a 55W air pump, while another air pump is connected into the same ½ inch air line and is connected to a solar powered backup system.

I do enjoy tinkering with my aquaponics setup, just as much as looking after it, but since the last rebuild a year ago it is running flawlessly. And without scope for more improvement, I will have to look for additional hobbies. Hopefully, this won't include learning how to cook the aquaponic produce! ●



Handy thermometer for water and air temperature



Peas are taking off in the growbeds

Watercress

is good for you!

By **Rowena Mansfield**

There are two varieties of watercress – *nasturtium officinale* and *nasturtium microphyllum* and also a red leaf hybrid with all the same benefits of the original green leaved variety but adds a touch of colour to salad mixes.

Watercress needs a damp wet environment to grow and thrive, making it ideal for hydroponic and aquaponic systems. Though it prefers water which is slightly alkaline, as long as the roots are kept wet and the plant has some sunshine it will thrive.

Seeds can be sown directly onto the growing medium and will soon grow and become established. Once established the plants can be harvested and regrowth will quickly take place. It is very much a "cut and come again" plant.

The plants are usually harvested before flowering but the flowers can be eaten though these have a stronger slightly bitter taste.

Watercress is known nowadays as the *New Superfood* even though it has been grown and eaten for centuries – with many claims made about it over the decades.

A hair rub or shampoo is said to make your hair grow and be revitalised. It

is also said to be a mental stimulant and to be an aphrodisiac!

All these claims aside – watercress does contain over 15 vitamins, minerals and phytochemicals and contains more vit.C than oranges, more calcium than milk and more iron than spinach. All these alongside a well balanced diet play an important role in maintaining the body's good health.

The many vitamins, minerals and phytochemicals in Watercress help to maintain healthy skin, bones, eyes, hair, nails, liver and blood and helps maintain energy levels and protects the immune system. Research is currently being carried out worldwide into the anti-cancer

properties of watercress.

Water cress have plump leaves which have a delicious peppery taste and is a very versatile food, being able to be used not only in a salad, but also in many differing recipes. It combines well with strongly flavoured foods such as garlic, chilli, ginger and onion. It can also be used as an attractive garnish for sandwiches, cold meat platters, fish dishes, etc.

We have been growing watercress for over five years in our hydroponic systems and are now developing systems using aquaponics to see if the fish nutrient rich water benefits the growth better than with hydroponics.

Our watercress has been grown in hydroton





clayballs in both AP and HP systems in a flood and drain system and also a CHIFT/PIST system and we have found that both systems are equally good.

We are fortunate in this temperate climate to grow watercress throughout the year – though we have had a few problems with plants getting frozen in the very cold weather, but fortunately the plants soon pick up as the day warms up.

There is an ever-increasing demand for locally grown fresh watercress along with

other produce and customers seem to be quite willing to pay a premium price for this.

We sell watercress in three bagged sizes:

- 1.110 gm bag.
2. 250 gm bag.
3. 500gm-catering sized bag.

Our produce is not washed before packaging but labelled with date of picking, weight, our address and with a request to wash before using. These instructions are conforming to UK trading standards legislation.



SOME WATERCRESS IDEAS:

Here are three quick and easy recipes for you to try.

Watercress Soup

Ingredients

- 1 Onion, peeled and roughly chopped
- 25g butter
- 250g potatoes, peeled and diced
- 600ml chicken stock
- 1 x 110gm bag of watercress, roughly chopped
- 50ml cream
- Add milk if needed, also seasoning

Method

In a large pan, cook the onion in the butter until soft but not browned.



Add the potatoes and stock and cook until the potatoes are soft (approx 15-20 minutes). When potatoes are almost cooked, add the watercress (try to allow not longer than 5 minutes cooking time for the watercress).

Liquidise, add the cream, add a little extra milk if the soup seems too thick. Season and serve either hot or cold and enjoy.

Lovely with fresh baked bread!

Poached egg on Watercress

- Fry gently 1 onion and some small button mushrooms
- Poach enough eggs for however number of people
- Add watercress to frying pan whilst eggs are cooking and cook briefly
- Arrange the eggs on watercress mixture on individual plates
- Pour cream or natural yoghurt over and add some grated cheese
- Quickly brown under a hot grill – and serve immediately!
- Delicious served with hot buttered toast cut into *fingers*

Enjoy!

Cheese and Watercress Pate

- Gently fry some spring onions and watercress

- Blend together in blender until smooth
- Place in a bowl and leave to cool
- Add some soft cream cheese and some mature strong cheese to the cooled mixture and mash together
- Season to taste and chill for at least an hour before serving
- This pate can be served with fresh bread, pitta bread or crackers and served with a side finger salad.
- The pate will keep in an airtight container in a fridge for a couple of days. ●

Our Two Day Courses for 2010 covering hydroponics and aquaponics are on:

- 11/12th September 2010
- 9am-5pm both days.
- Luncheon and light refreshments provided
- Accommodation can be found in the vicinity if required

We also provide Intensive One Day Courses by arrangement These have proved to be very popular.

We have Open Days here on:
• Saturday 28th August 2010 from 1- 6pm

For more information contact:
Rowena@herbsfromwales.co.uk
or www.herbsfromwales.co.uk
All are welcome.

Group Tours of our growing units here can also be arranged.



Food and fish free from the backyard

By **Faye Arcaro**

It all began in December, 2004, when Milne Matthews retired from his full time job. He had always been a keen gardener, so when he moved back to a suburban block in Sunbury, with wife Margaret, he decided that he would like to set up a glasshouse. He found a competitively priced glasshouse online, through eBay. His first crop of plants was very productive and set a high standard.

Later that year while watching a segment on Gardening Australia, he saw Joel Malcolms' aquaponics system. After watching the segment "My whole idea on gardening changed," recalls Milne.

He then began planning his own system and decided to use some of the materials he had collected over the years. Milne began building his system and readily admits, "There were a few hiccups along the way - like the time when I poisoned fifty silver perch the Thursday before hosting a BYAP forum meeting." He announced to his guests, upon showing them the system, "This is where the fish should be, but carked it two days ago."

The original system was two Industrial Bulk Containers (IBC) and three growbeds; which has gradually expanded to a total of 5000 litres, shared between the fish tanks, and eleven growbeds of different styles and

configurations. This allows Milne to fulfil his passion for experimenting and tinkering with different designs.

SYSTEM DESIGN

The system can be run as a single unit or separated and run individually. Milne has installed various valves that allow him to separate the systems. This allows systems to be isolated from one another, which comes in handy when Milne wants to stock different fish, as each systems temperature can be controlled.

Some of the successful crops that Milne has grown include: tomatoes, onions, carrots, lettuce, cauliflower, cabbage as well as



Milne in his glasshouse



Overview of his aquaponic system

h



Glasshouse abundance



Trout harvest



Tyre retaining walls and media beds



Lush healthy growth

Advice from Milne!

Just a warning!

- If thinking aquaponics say goodbye to all your spare time for the next 2 years, after you build the first one you will be thinking of the second and third.
- You will dream about aquaponics
- You will bore all of your friends with aquaponics.
- You will get up at 2 am just to see if everything is ok.
- The wife will get grumpy because nothing is done about the house.
- When you go on holidays you will ring the neighbours just to check that the pumps are still running.
- But after 2 years the obsession will slowly wear off and the system will look after itself [like it had for the last 18 months]
- Then all you have to do is feed the fish if you think of it and pick the veggies!

various herbs.

Trout were harvested weighing up

to 500 grams and then frozen or smoked and vacuum sealed.

If you want to know anything about recycling, preserving or growing, Milne has an abundance of knowledge and is always very hospitable, sharing his passion with other willing aquaponic enthusiasts.

TYRE RETAINING WALLS

The home is built on a sloping block, overlooking natural bush land and sits high on a rocky hillside. To provide a place for his various aquaponics systems, Milne used old tyres to create



Our Favourite Tanks

retaining walls to hold back soil. He created the wall with the help of an excavator, which was used to move the soil. Milne recommends compacting the soil into each tyre, as you go, and pushing them hard up against one another, to create a solid retaining wall. The wall took about three weeks to build, with Milne filling a few tyres each day.

WICKING BEDS

"I got the idea for wicking beds from the Aussies Living Simply Forum. It's a normal garden bed, except that it is lined one third of the way up with pond liner. This keeps the bottom third constantly moist, and acts as a water reservoir. When the top two thirds of the bed begin to dry out, moisture is drawn up through the soil from the bottom third – keeping the bed perfectly moist."

The bed is filled with a mixture of soil, vermiculite and coco coir, plus the usual mix of organic matter and fertiliser. The beauty about wicking beds is that they use very little water, as very little is lost through leaching. Milne has converted one of his four garden beds to a wicking bed and has been pleasantly surprised. He says he will carefully monitor the bed, before changing the rest of his beds. More information can be found by searching for wicking beds, on the internet.



Tomatoes and corn

OFF THE FORUM

Milne has been an active contributor on the Backyard Aquaponics Forum, since the early days.

TCLynx:

So it sounds like everything seems to work well for you



Is there a bed or method or media or whatever that you would not do again or would warn others away from



Is there something you have found that doesn't work for you?

FoodandFish:

I would probably say vermiculite [saying that, these beds are still going and will probably get another two years out of them] doing it again, CHIFT PIST is the way to go, providing you have the space. The vermiculite bed and the one with the grape vine in it has thousands of worms [just like a worm farm] so it would be safe to say that the system is running partly on worm tea.

Dave Donley:

Yep, you've set up many types of plant beds - which type is your favourite?

FoodandFish:

Hi Dave, I think my favourite is the flood and drain 20 mm scoria [a bit hard on the hands, but it's cheap] next is vermiculite. I haven't had a crop failure in it yet. [Yes I must admit, after three years it is starting to break down] then there's expanded clay balls - beautiful to work with – and if you can afford it, go for it. I also have 0.5 cm blue metal that I haven't had dramas with.

"As most of the long termers know, once the system establishes a strong bacteria colony they are pretty much bullet proof."

I can plant ten plants in ten different aquaponic beds and you get ten plants to harvest all about the same day.



Aquaponic lemon tree

Sun drying tomatoes



“As most long termers know, once the system establishes a strong bacteria colony they are pretty much bullet proof.”



TESTIMONIALS

Adzza:

A wonderful setup and an abundance of advice regarding all things aquaponics - amongst other topics!
Just wanted to thank you for your fantastic hospitality, and welcoming us into your yard for a thorough explanation on tried and tested methods of producing a successful aquaponics system. We plan on cooking that fish up tonight that you kindly gave us, and are quite excited!

Cheers



been avoided, such as turning off a switch and forgetting to turn it back on. Milne shares a HSM with us and the lesson that he learned.

FoodandFish:

Minor HSM today could have been major. Went to Elmore Field Day came home and was stuffed so had sleepies from 3 30 till 5 pm woke up and no power. Went to check the fish, even with the backup the trout were swimming near the top.

That's OK dragged the generator out, no petrol, none in the can so got the chainsaw fuel, got the genny started, got the extension plugged into the genny, went to the glasshouse. As I picked up the air pump lead the power came back on!

So the lesson for today; make sure that you have petrol and run your backup once a month! ●

Vegiegirl:

Speaking of eating fish, a belated thank you to Food and Fish, for a preview of two SUPERB trout, plucked fresh from one of his tanks, cleaned on the spot, and sent home with us to bake with some garlic, lemon and parsley.

Although I grew up eating fresh fish, I had never had fresh trout (we didn't have those in the Broken or Goulburn Rivers) I didn't know they could taste so sweet.

Advice from F&F has meant that we now have a cycling system, with some goldfish and some surviving silver perch (after two ill-fated episodes with some short-lived trout - too hot when moved, then silver perch, too cold when bought), and have some more silver perch ordered for late November.

Hope to repay the favour one day with some fish of our own!

HEART STOPPING MOMENTS CREATE LESSONS LEARNED

Most aquaponics enthusiasts are familiar with the acronym HSM which stands for Heart Stopping Moment. Most moments are due to seemingly silly actions, which could simply have



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In the Garage

Slugs in the



Before you take your slug killing mixture and rush into the garden, you should read on and get to know this slimy animal a little better.

garden

By Faye Arcaro

“Believe it or not, many species of slugs play a vital role in our ecosystem”

The word **slug** is commonly used worldwide and refers to a gastropod mollusc. This type of mollusc does not have a shell to hide in; some species have a reduced shell or even a tiny internal shell. The common snail however, which is also a gastropod, has a coiled shell big enough to retract into when necessary.

A slug is a direct descendant of the snail which gradually evolved without a shell. Despite close similarities in body form, various groups of slugs are not related. There are sea slugs which are only found in marine life and then the air breathing kind which are only found on land.

A slug's body is made of mostly water and because it does not have a full shell like its snail counterparts, their soft tissue will dehydrate in dry places. The shiny mucus you see on the ground, walls and on plants is a protective mucus layer which the slug excretes. You will find many slugs come out to play just after a bout of rain because of the humidity in the air. You will also come across many who hide under moist structures like growbed media, rocks, bark and fallen logs for the same reason - to retain their moisture.

The dreaded slime trails on your property is also a sure sign that they are leaving signs for each other. The trails are used to prepare for mating, for recognition of the same species and some carnivorous slugs will follow a trail hoping to find a meal at the end of it.

The mucus at the end of the foot contains fibres which help them from slipping off vertical surfaces. Some even suspend themselves with their slime cords during copulation.

Some birds find slugs distasteful and will stay away from your garden and will soon find another place to feed. Fish on the other hand will find them to be a tasty morsel, particularly trout that will attack anything as soon as it lands on the water surface. If slugs are not to the liking of a certain fish they spit them back in a

very short period of time. In either case, it is worth trying as they provide another source of protein in a fish's diet.



Slug eggs



An amazing Leopard slug

ECOLOGY

Believe it or not, many species of slugs play a vital role in our ecosystem. They recycle by eating dead leaves and decaying vegetables and fruit matter. They also feed on certain types of fungi and it may therefore be worthwhile having a few around.

PREDATORS

They too are predators and they like eating their own and dining on a few earthworms as well. The carnivorous kind can also clean up other dead snails or slugs. Their enemies are hedgehogs, rats, humans, snakes, frogs and the eastern box turtle. Some birds will not be deterred by the foul tasting mucus and many beetles find them delicious.

RELEVANCE TO HUMANS

A small number of species are seen to be pests in the horticulture and agriculture industries. They destroy foliage at an alarming rate and would leave the plant useless. They feed on fruits and vegetables just prior to harvesting, leaving crops damaged and unsuitable to sell because of aesthetic reasons. It is not uncommon to plant out new seedlings and return the next day to find them chewed off at ground level with no sign of a pest other than the tell tale trail left in it's wake.

They are harmless to humans and only a few cases have been noted where individuals have contracted parasite-induced meningitis which they obtained while eating raw slugs.

TOO MANY SLUGS IN THE GARDEN?

If you find that you have an infestation of slugs then you can do a few things: try to get in a few of their natural predators if you do



Kookaburras a natural predator



not want to use harmful chemicals in your garden or on your crops. Slugs love certain plants like calendula, marigolds, comfrey, zinnias, beans, cabbage and green lettuce. These are seen as trap crops and will keep the slugs away from your prized plants.

Another particularly effective form of trapping is to lure the slugs to a saucer of beer, the pests are attracted by the yeast and once they are in, they drown and may easily be removed from the system. Other inexpensive methods include using the rinds from fruit such as melons or citrus. As slugs like to shelter in dark places they will seek the moist inside dome and may easily be disposed of the following morning.

On the other hand, you could repel them by planting barriers like mint, chives, red lettuce, sage, sunflower, fennel, garlic, foxgloves, chicory and endive. Plant these around the perimeter of your garden which will keep them from penetrating to where you keep your gold medal winners. Crushed eggshells, hair, ash, wood shavings and diatomaceous earth will also keep them away if you sprinkle these substances around susceptible plants, but keep them dry. Iron based slug and snail pellets can also be used as a bait and when dissolved the iron is available to be taken up by the plants, the pellets cause stomach and intestinal discomfort and the slug becomes uninterested in feeding and will slither off and starve within a few days, leaving plants pest free.

When a slug comes into contact with copper there is a toxic reaction which will instantly repel them, however this is not recommended for use in aquaponic systems as copper may have a detrimental effect on fish.

If you happen to discover translucent pearls amongst the plant roots or media when working in your aquaponic system then you have an ideal opportunity to nip the problem in the bud. These jelly like balls that are around the same size as tapioca



beads, and look surprisingly similar to tapioca, are actually slug eggs. All that is required to prevent the next generation is to discard the cluster or allow them to dry out from exposure to sunlight.

On a lighter note, there is another use for the garden slug, *Arion hortensis*. Can you believe it is used in the treatment of stomach ulcers and gastritis? You need to

swallow them whole and while they are alive. The people from rural Southern Italy swear by it. Some products are currently being developed where the mucus of the slug is used in the treatment of warts, inflammation, acne, wounds and dermatitis. So give our garden slug a chance, curb his enthusiasm if he causes damage, but think twice before you kill him off completely or just simply swallow him whole! ●



The Siphon

By Joel Malcolm

I start this topic with a degree of intrepidation as the siphon is a mystical beast that's rather hard to define. Firstly, there are two ways to spell the word. Siphon or syphon, seem to be reasonably interchangeable, depending on what you prefer or where you reference when looking for the correct spelling. For the purposes of this article we'll use the spelling "siphon" even though a check of the Oxford Dictionary says that spelling can be either way.

When it comes to the slippery siphon it seems we can't even trust the Oxford Dictionary. In fact for the past hundred years you couldn't trust most dictionary definitions of a siphon because quite simply, they all got it wrong. This recently came to light in April 2010, when a physics lecturer from the University of Technology in Brisbane, Australia, Mr Stephen Hughes, started some research as part of a paper he was writing. To his amazement he discovered the definition in his dictionary to be incorrect; the Oxford Dictionary defines a siphon as

"noun; a tube used to convey liquid upwards from a container and then down to a lower level, the flow being maintained by atmospheric pressure."

The main force that operates a siphon is not atmospheric pressure, but rather gravitational force.

A spokesperson for the dictionary stated that the definition was written by "Editors who were not scientists. And the definition would be corrected in the next edition".

This might give you some idea of just how elusive siphons are, the fact that their definition could be wrong in almost all dictionary definitions for the past 100 years without anyone noticing. Because in essence they were partly right, you see siphons do what they do because of a number of different forces. The force performing the majority of "work" in a siphon is the gravitational force, but a siphon couldn't work without atmospheric pressure as well.

As water is drawn up and over a rise, within a tube or pipe and then down to the bottom vessel, the weight of water in the long pipe leading down to the lower vessel forces the water down. This means that the water in the shorter up section of pipe, at the higher vessel has low pressure - lower than the outside atmospheric pressure that is acting on the water surface in the top vessel, this is what allows the water to move uphill against gravity.

In simple terms and for the purposes of aquaponics, a siphon is a method for moving liquid from a higher vessel, up and over an obstacle, and down to a lower vessel. Siphons are used in many varied applications from home brewing to enormous irrigation projects. Most applications of siphons in aquaponics are incorporating what is commonly termed an "auto-siphon." An auto-siphon is a siphon that starts itself, or is self priming, and they are most commonly used within a growbed to drain a growbed of its water. Auto-siphons are also used in aquaponic systems that are designed with an upper reservoir that dumps water

into growbeds. In both these cases water slowly fills the growbed or the reservoir, as the water level reaches a certain point, the top of the siphon, the water flows over the high point and down, triggering the siphon action and emptying the water from the reservoir or growbed, into the lower vessel of growbed, until air is sucked into the siphon breaking the siphon action.

Siphons in aquaponic systems generally take on a few different common guises. There's the bell siphon, a loop siphon, or just a pipe siphon, these are all used to varying effect in aquaponic systems in various ways. There are many advantages to using siphons in an aquaponics system; there are also a few disadvantages.

Advantages

- Simple method of flooding and draining
- Can be extremely cheap, like just a loop in a drain pipe
- Cuts the need for timers in a system

Disadvantages

- Can be tricky to get going if pipe sizes and water flows are not correct
- Can be tricky to keep going if pipe sizes and water flows are not correct
- Some siphon designs are susceptible to stopping when water flow rates change

In future editions we will be examining the different methods of using siphons in aquaponics, we will be looking in detail at different designs, adaptations and modifications that help the operation and reliability of auto-siphons.

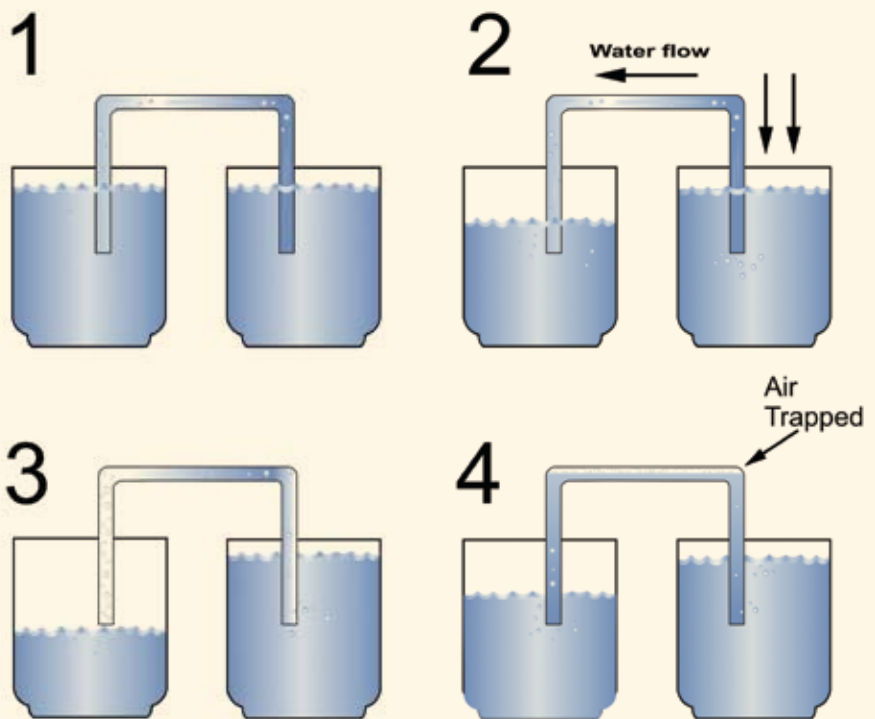




WATER BRIDGE

A water bridge is the most simple of all siphons. It is a very basic design and is often used to equalise the water levels between fish tanks, in an aquaponic system. The water bridge works by using a pipe that is placed at equal heights in both tanks. It is very important that the pipe contains only water, and does not have any air bubbles, as these will ultimately cause the siphon to fail. Each end of the water bridging pipe must always be submersed in water; otherwise the siphon will be broken.

The water bridge works by using the atmospheric pressure that is pushing down on the surface of the water in each tank. The water bridge uses gravity to equalise the water in each tank, and so water flows from the higher level to the lower level, until it is equal.



1. Both water tanks will keep an equal water level
2. When one level drops water flows through the pipe to restore an equal level in each tank.
3. Should one end of the pipe become exposed, air will enter the pipe.
4. Once air becomes trapped within the pipe no siphon action can happen.

Advantages

- Simple siphon
- Reliably levels water between vessels

Disadvantages

- Siphon can break easily (if water level falls below water bridge)
- Equalises vessels fairly slowly





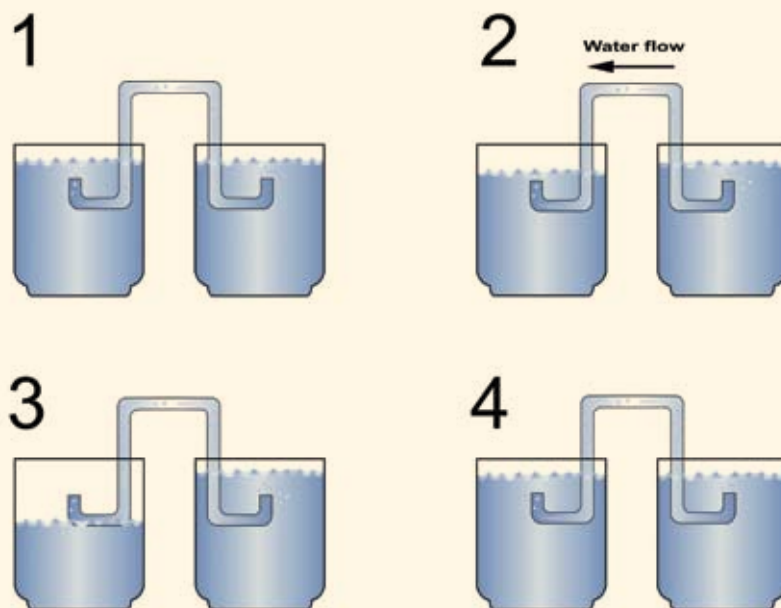
On the Deck Chairs

U-BEND SIPHON

A U-bend siphon is also known as a no-holes overflow. It derives its name from the distinctive "U" shape that is formed at either end of the siphon. This simple siphon works similarly to a water bridge, the only difference is that this siphon will hold the water in the pipe when the water drops below the "U" bend.

The "U" bend stops the gravitational force pulling the water out of the water bridge, by using atmospheric pressure on the upside of the "U" bend. The atmospheric pressure pushes down on the water at either end of the "U" bend and counteracts the gravitational force pushing down on the water in the pipe – thus holding it within the water bridge. The "U" bend will only hold the water, if the level of the pipe is equal at both ends.

When the water level in either vessel rises above the "U" bend, it is siphoned into the other vessel, until both vessels are equal in height. Some people have found it useful to add a "U" bend to the outlet of bell siphons, this adds some back pressure to the outlet and helps keep the siphoning action cycling.



1. Both water tanks will keep an equal water level.
2. When one level drops, water flows through the pipe to restore an equal level in each tank.
3. Should either end of the pipe be exposed the siphon will stay "primed" as air can not enter the pipe.
4. Both water tanks will always keep the same water level.

Advantages

- Will not break when water level drops below the bottom of the water bridge
- Reliably equals the water in both vessels

Disadvantages

- Equalises vessels fairly slowly
- Siphon must be perfectly level in both vessels to work

THE BELL SIPHON

One of the simplest compact methods of creating a siphon is the use of a bell siphon. The bell siphon packs neatly into a small area by the use of pipe within pipe method. The bell siphon works by using a bell shaped cover over the standpipe, to create a siphon. The standpipe sets the high water level in the growbed. When the water reaches this level a siphon starts and water is siphoned out of the growbed until the siphon is broken by the air break tube. The air break tube is a small tube that is connected to the uppermost point of the bell and is cut at the preferred siphon breaking height.

A media separator is used in conjunction with

the bell siphon to stop the media interfering with the siphon.

Advantages

- Automatic
- Most reliable siphon
- Easy to clean and maintain
- Straightforward design
- Simple to alter

Disadvantages

- Air tube may block and fail to break siphon
- Filling flow rate must be less than that of the siphon
- Specific parameters must be followed in order for the siphon to work

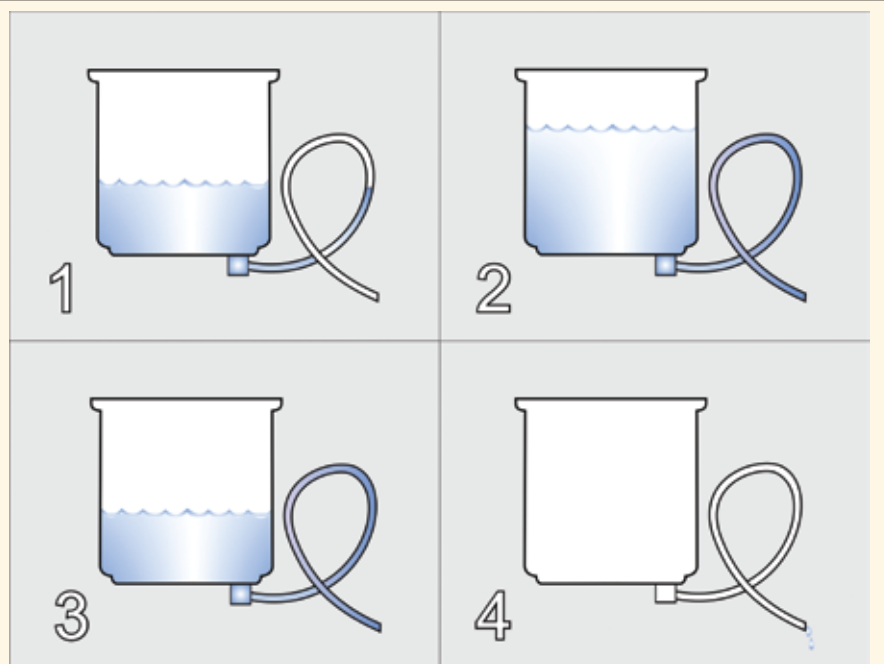




LOOP SIPHON

A loop siphon is a basic siphon to flush water from an upper vessel into a lower vessel. It works best with a smooth continuous loop of pipe – with no joints. The more flexible the pipe the better – as it will not be prone to kinking over time. A looped siphon is just that – a loop. The loop can be placed either on the inside or the outside of the growbed. The loop works best when it has a horizontal intake from the growbed, and a vertical outlet. The crest or uppermost part of the loop represents the height of the water needed to initiate the siphon. Therefore the crest of the loop should be two or three centimetres below the top of the growbed gravel.

The loop siphon will start once the water in the growbed reaches the top of the loop, the water will then be siphoned out of the growbed until the water level drops below the bottom of the inlet – which will draw air into the loop and break the siphon.



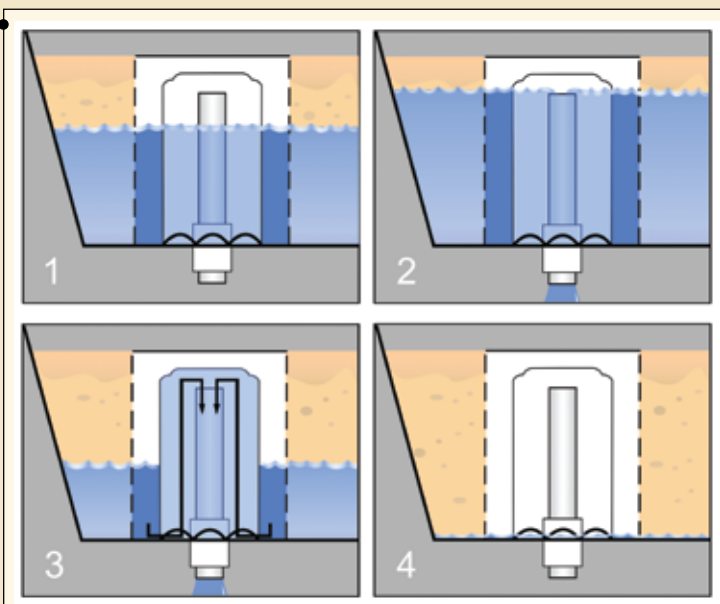
1. Water level rises in tank /growbed and in looped pipe.
2. When water level reaches top of loop the siphon starts as water falls down the other side of the loop.
3. Water drains from the tank/growbed quickly out of the loop siphon.
4. Siphon action stops when air is drawn in as tank/growbed is empty.

Advantages

- Automatic
- Quickly empties growbed of water
- Siphon can be easily adjusted

Disadvantages

- Filling flow rate must be less than that of the siphon
- Clogging of the siphon will cause it to fail
- Kinking of the pipe restricts the siphons flow



1. Water level rises in tank/growbed till it reached the top of the inner standpipe.
2. Water flowing over standpipe starts the siphon, drawing water up the outer bell and down the standpipe.
3. Water drains quickly from the tank/growbed as it's drawn up the bell and down the drain.
4. As the tank/growbed is emptied, air is sucked in the bottom of the bell breaking the siphon. •



Aquaponics designed for *production and*

By **Rob Torcellini**

My aquaponic system was started completely by accident. Our family has been farming and gardening in New England for generations. If you had asked me what aquaculture or hydroponics was, I would have responded it was the futuristic ride at Disney's Epcot centre.





pleasure

A couple of years ago I built a kit greenhouse hoping to get some plants started earlier for my traditional dirt garden. I live in Connecticut and we have some extreme temperature swings. Typically, it ranges from -10°C and lower during the winter to hitting nearly 38°C in the summer. In the spring it is very difficult to plant most vegetables until all risk of frost is gone. My goal was to get the plants started in the greenhouse and use a large water tank as a heat sink to help moderate the day and night temperature swings. Harbor Freight manufactured a huge home gardener greenhouse at a very reasonable cost and I thought it would be great to get my plants started in it.

The construction for the 4500 litre tank consisted of plywood, 2x4's, and a rubber pond liner. It worked well, but quickly became infested with mosquitoes so I threw in a couple of goldfish to control them. Soon the water became murky with fish waste and algae. A friend gave me a couple of water hyacinths that multiplied and covered the water surface. The hyacinths worked so well that the water was crystal-clear and

they started to die off from lack of nutrients.

Realising the potential of this liquefied fertiliser and the need to keep my plants watered in the daytime heat, I started to scour the internet to see if anyone else watered their plants with wastewater. Suddenly I was thrust into the depths of aquaponics and quickly drowned in terminology that I should have learned in a chemistry class. Looking back, the entire concept was quite simple and I've found growing plants with aquaponics to be easier than traditional dirt gardening.

I cleaned everything out of the greenhouse to start with a clean slate. A company for whom I do contract work had given me a couple of polyethylene tanks so they were put into action. I dug a hole into the floor for a sump. Next I fabricated four growbeds from 20 cm pipes and five strawberry towers from 10 cm pipes, filling each with 1 cm crushed stone.

Much to my amazement, not only did the plants survive, they flourished! It was quite exciting to be able to pick lettuce, broccoli, peas, green beans, radishes, and

“Looking back, the entire concept was quite simple and I've found growing plants with aquaponics to be easier than traditional dirt gardening”



Stacking vertically to save space



The greenhouse



4500L fish tank



Our Favourite Tanks



Healthy tomatoes



Sequencing valve



Large poly tank



Controller



Great crop of beans and carrots

carrots long before anyone else in this area. The next season, I grew carrots in a deeper bed since they grew far better than I anticipated and hit against the bottom of the bed.

With the newfound success of growing in gravel, it was time to get rid of any dirt-bound plants in the greenhouse. I built three larger beds from steel pipe, plywood, and a pond liner, carefully positioning them into my once huge, now tiny, greenhouse. Along the north wall, I installed a 10 cm pipe bed that was able to hold 7 cm net pots. By early summer, my tiny greenhouse looked like a tropical jungle. The cucumbers and tomatoes were climbing overhead. One single cherry tomato plant produced over four hundred tomatoes and would have continued if it hadn't succumbed to a severe blight during the season.

The cucumbers were so plentiful, that it was difficult to navigate between the beds without bumping my head into a hanging fruit. Meanwhile, the earth garden with eight plants yielded few cucumbers. Between the drought conditions and pests,

it wasn't worth the effort to care for those plants when just two plants were growing so well in the greenhouse. The only "work" required was to train them to grow in the right direction. Any place where I picked a fruit, two flowers would appear and two new cucumbers would grow! Bags of fresh cucumbers would make their way into our office with eager co-workers taking all they could get. They were sceptical after hearing about the unconventional way they were grown, but once they tried them, they would always come back for more.

Typically, my traditional garden needs a great deal of attention, as it becomes overcome by weeds, Japanese beetles and grubs, rabbits, and drought. The greenhouse has its own challenges such as excessive heat, whiteflies and aphids, mildew, and system failures with

“The cucumbers were so plentiful, that it was difficult to navigate between the beds without bumping my head into a hanging fruit.”



Lettuce are very happy



Strawberry towers

the pumps or computers. However, I find it easier to work with these issues than the never-ending list of problems with the traditional garden.

Seeking to shorten the time involved in caring for my crops led to automating the greenhouse functions with a custom computerised control. The first part of automation was a sequencing valve to insure only one of the six growbed systems could be filled at a time. Next was the automatic fish feeder. The computer monitors the water temperature and only feeds the fish enough food based on their metabolism. A light sensor is used to start and stop the entire system at night in an effort to conserve energy. Temperature sensors in the air and water are used to open vents or circulate water through a solar heating system. The data collected is sent through internet to a web site where I can monitor and make adjustments as needed – all from the comfort of my office chair!

The greenhouse is a constant work-in-progress. Keeping a balance between the plants, fish, and environmental conditions can be a challenge, but also has great rewards when it's working properly. Just about any home gardener could set up a simple system in their own backyard and enjoy fresh fruits and vegetables all year long. ●

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Picking from the patch

Three months on and we are well and truly into a new season. Last season's fresh harvest is long gone and a new season is underway.

By **Mark England**

Three months on and we are well and truly into a new season. Last season's fresh harvest is long gone and a new season is underway.

We haven't said a complete goodbye to last

season's pick though. The aquaponics system produced so much that we decided to preserve a good portion of it. It means we can enjoy it all year round as sauces, pickles and chutneys. It's not something that I thought I'd be doing. I never dreamed that we would produce more than what we could eat immediately.

One particular day, I was making some rhubarb and ginger jam. My rhubarb wasn't bright red at all but it was ripe and ready for picking. I pondered using an artificial colouring to make it visually appealing but I had beautiful organic rhubarb. How could I add something less than perfect to the jam.

I just happened to be walking past the beetroot and hit on an idea. I could

juice the beetroot to make a red colouring. The final result was spot on. The colour was just perfect without being over the top. Needless to say the three jars of jam didn't last very long. Luckily the rhubarb is again almost ready to pick.

Thinking of different ways to use and preserve your harvest is just one of the great things to look forward to as things ripen ready for picking. It means you can enjoy a previous harvest and not fight the seasons trying to grow something all year round.

In the last edition I spoke about our experiment of mixing up the seeds in one grow bed and seeing how it grows. I'm still undecided as to if it's a good idea or not. On one hand its been fun searching through



rhubarb and ginger jam



“I never dreamed that we would produce more than what we could eat immediately”

Day 192

Today we picked up our chicks. These Belgian d'Uccle's announced dew-claws. Until we spoke to the breeder we had no idea these beautiful hens even existed.

They are so plucky and have great colouring and have become a great addition to the patch. We want to give these guys all our green waste from the aquaponics garden so they can turn it into compost for us and we'll also get some delicious eggs as a bonus. The



We have called them Pilly, Molly and Daisy. They are so much fun to watch.



Today we let them out for the first time for a little while. It will be good when the weekend comes so we can let them out a bit longer.



2 comments · Link to this post

Day 188

We've been contemplating for quite a while now about getting some chickens. We think it would be great for a number of reasons including

1. Great for the kids.
2. Our current compost efforts aren't keeping up with our green waste from the patch.
3. We could use the eggs they produce and the chicken poo as a compost.

SO we bought ourselves a Chook pen. I pick it up in two days and our weekend project will be building the pen and getting it ready for some chicks. We are going to get two brown as they are great layers and fairly good with kids. We really think it will be a great addition. They can eat our lovely green waste from the patch which we have heaps of and means we'll get fresh organic eggs. I'll post some pics in a few days of our progress.

2 comments · Link to this post

Day 184

4 months. Can you believe that its gone so quick. It seems that it wasn't that long at all since I first started this blog. Certainly things are slowing in the patch and I do need to get out there and do a little closer. Its becoming a little over grown and needs a good tidy so I will do that tomorrow. But to celebrate half a year we decided to pick some more and tonight we enjoyed silver beet, cauliflower and the most successful carrots yet. We've never had much luck with carrots but these weren't too bad at all.



Well here's to the next 6 months. As spring will soon be here I can only imagine how much better this blog will get. Thanks for sticking it out with us and we look forward to the second half of the year in the patch.

Each magazine edition we will follow Mark and his family as they continue to experiment and eat from their aquaponics system. You can also follow their blog online at www.harvest365.blogspot.com

the grow bed looking for beans or radishes and finding one where you looked just yesterday but had found nothing.

It seems to have stopped the caterpillars from attacking the spinach and other leafy greens but it also really makes it difficult to see how things are growing.

There are numerous seeds planted with which I have not seen growth at all. I can't tell if they are sprouting because they are hidden below the faster growing plants. It also means I can't replant a section because the whole bed is full of other things that did grow and moving them may prove to be difficult. So it's been both good and not so good. It has its pros and cons but at this stage I am leaning on not mixing the seeds again.

One of the few expenses we have now that our system is up and running is seeds. It's not overly expensive but imagine if we could wipe out the need to buy seeds. I have been trying to gather as much information as possible about heirloom seeds. Basically they are old varieties of seeds that have been passed down from generation to generation. Seeds that haven't been modified in any way and can be grown and saved from harvest to harvest.

I envisage picking seeds from the healthiest plants grown in the BYAP

system and using them next time. By saving the strongest, the seeds will also evolve into seeds that are ideal for aquaponics producing bumper crops season to season.

The hardest thing though is to avoid the temptation to eat all these fantastic veggies grown in the aquaponics system and save some seeds.

Till next time. Enjoy "picking from your patch". ●

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Affnan Siphon

By **Affnan Ramli**

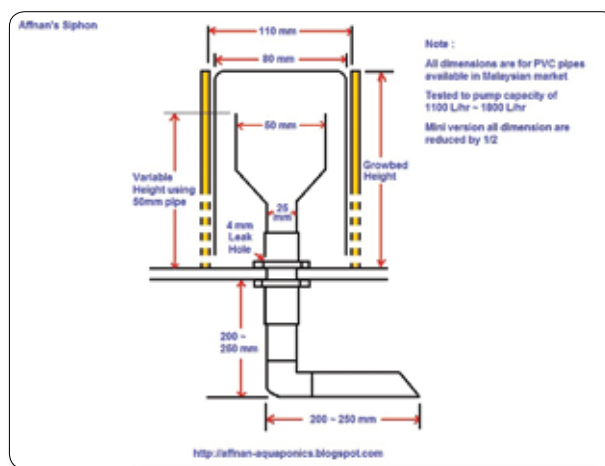
Aquaponics is something new to me - I started doing Aquaponics in 2008. I'm keen on aquaponics because of the space limitations I have in my backyard - I have to maximise the little space that I have.

The initial stages of my aquaponics endeavour were not as smooth sailing as what it is now. I had countless failures, mainly due to difficulties in controlling the water in the growbeds.

I wanted to use siphons to control the flooding and draining of my growbeds and I tried so many different siphon designs with very limited success. In fact I almost gave up on the whole aquaponics project. Finally after about eight months of endless testing and trialling the different variations of the siphon, I managed to improve the siphon, which made it more reliable for flooding and draining the growbeds. This modified siphon makes use of some principles of aerodynamics to improve the reliability and make it easier to use.

What follows is a brief write up about this modified bell siphon that I use in my aquaponics setup, how it functions and why in my opinion it works so well in my setup, and why it is an improvement on standard siphons many people are using.

To put it simply the main aspect of the modification in comparison to a standard bell siphon is just putting a funnel at the inlet of the stand pipe.



Affnan siphon showing funnel shape modification

WHAT EFFECT DOES THE FUNNEL HAVE ON THE SIPHON?

To understand this we need to look at the basic bell siphon, where a stand pipe is covered by a bell shaped enclosure; that causes the siphon action to start once water overflows the stand pipe. This is a very simple way to produce a siphon, however in aquaponic systems, the continuous flowing of the water into the bed causes a problem when the siphon stops.

Towards the end of a siphoning cycle, water flowing into the growbed will reach an equilibrium, which interferes with the siphon, causing it to continue draining the bed. This phenomenon can have grave consequences to an aquaponics system, as the water cannot reach the plants roots.

The equilibrium flow occurs because the water coming into the growbed is the same or slightly more than the water leaving the

bed, through the siphon. Therefore creating an equal exchange of water in and out - this continues the siphon.

To counteract this we need to reduce the flow rate for the siphon to start; to less than that needed for the equilibrium flow. As well as this we need to increase the siphon velocity which will cause the siphon to drain the growbed faster at end of

the siphon cycle - which causes more air to be drawn into the siphon.

A funnel installed at the top of the standpipe will increase the siphons velocity, and break the siphon at the end of the cycle. As water flows down the funnel it will converge at the bottom - causing an increase in its velocity. Bernoulli's principle states that as you increase the velocity of a fluid, the pressure will decrease.

So there will be a minute drop in pressure at the narrow point of the funnel, this drop in pressure creates an avalanche effect; so that more water will flow and air will be drawn out quicker by the stand pipe, creating the siphon sooner, with less water flow.

Therefore as water is depleted from the grow bed, it will draw in more air and make it difficult for water flowing into the growbed to catch up and sustain the siphon equilibrium.

The higher water velocity, due to the funnel, also makes it possible for this siphon to operate with a broad range of water flow rates. I have tested a 50mm funnel on a 25mm stand pipe at 1100Lph to 1800Lph without a problem. This broad operating band is beneficial because it restricts the risk of siphon failure, due to decreasing velocity from an aging or old pump.

I have added a small hole at the bottom most part of the stand pipe, which allows the water to slowly drain away from the growbed; in case the pump stops pumping before the siphon starts.

This small hole is not needed if you have no intention of regularly switching off the pump, but I recommend that you have it since it

serves as an indicator for a working siphon cycle.

After using the siphon for a long time it may fail, almost six months for me. This is due to two reasons the first is a reduction in flow rate and the second is the stand pipe is dirty. What I recommend, is clean the stand pipe periodically with a bottle brush and regularly check your pump.

The main advantage of this siphon, in my opinion, is its simplicity in design that reduces the chances of failure and makes maintaining it extremely easy.

I hope my efforts to develop this siphon, will make it easier for beginners to practise aquaponics. I believe that this simple modification will make siphons a lot easier to build. ●



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By the Barbeque

Warm Spinach Casserole

By Faye Arcaro

Ingredients

- 1 cob loaf or Vienna loaf
- 250g steamed spinach, silverbeet or rainbow chard
- ½ packet French onion soup
- 600ml sour cream
- 250ml whole egg mayonnaise
- 2 Tablespoons chopped parsley
- 1 cup shredded parmesan cheese
- ½ cup spring onions or chives



Cob Loaf

By the Barbeque



Method

- Finely chop parsley and slice spring onions.
 - Squeeze all excess liquid from spinach, chop and shred finely.
 - Add dry soup mix, sour cream, mayonnaise, and parmesan cheese.
 - Gently combine all ingredients together.
 - Cut a lid off the top of the cob loaf and scoop all soft white bread out of the middle (set aside) leaving the crust resembling a bowl shape. Spoon the creamy spinach dip into bread case.
 - Place into preheated oven at 150°C. Take removed soft white bread filling as well as lid and break into small portions. Add to baking tray to become crispy forming crusty bite size dipping portions.
 - Warm through and garnish with parsley before serving.
- This makes a great informal warming winter dip to share amongst friends. After the small portions have been all used, guests are encouraged to break away the outer crust of the cob loaf and to continue enjoying the dip.**

Growing Power

Interview with **Rick Mueller** about **Aquaponics at Growing Power**

By **Sylvia Bernstein**

Growing Power in Milwaukee, Wisconsin has been described as Ground Zero for the Urban Farming movement in the U.S. It is a busy three acre site in a place that used to be called Greenhouse Alley, but is now considered a “food desert”. Growing Power are three miles from the nearest *Pick ‘n Save* grocery store but only half a mile from the largest low-income housing project in Milwaukee. Growing Power CEO, and a MacArthur Fellowship “Genius Grant” award winner, Will Allen and his team are trying to change all that. They use 2 250 kilograms of

worms, 4 500 kilograms of food waste, 7 250 kilograms of brewery waste, 25 000 pots, and the waste and flesh of 30 000 tilapia and lake perch to produce healthy food to feed 10 000 people in the surrounding neighbourhood.

Growing Power is a particularly fascinating laboratory for aquaponic learning because their home-spun growing method is a unique blend of continuous flow over shallow gravel beds using liberal quantities of vermicompost. Their 190 000 litres of systems are 27 000 litres each and start

with fish troughs dug 1.2m to 1.8m into the ground down the middle of the greenhouse. In those troughs they are primarily growing tilapia, plus some lake perch. The perch water is left unheated, but the tilapia water is heated via a swimming pool heater to 30°C. This in turn provides about 50% of the heat to the rest of the greenhouse. There are then one or two layers of shelves above the fish troughs that are 15cm deep and sloped so the fish water can be introduced at one end and flow through to the other where it returns to the tank. The first shelving layer is almost always





covered in 4cm of gravel, followed by a layer of vermicompost, and then topped with watercress cuttings. The top layer has no media. Instead 4 litre planters filled with a blend of vermicompost, compost, and coconut fibre (coir) are sown with salad and braising greens. The flowing fish water in the tray wicks up to the seeds as it flows past the pots.

Growing Power is all about the worms. If you ask Will Allen how many employees he has he replies that there are tens of thousands all working hard to produce his soil. They have taken their zeal for vermicompost and applied it to their aquaponic system; consistent with their conviction that vermicomposting has great benefits. Here are some of the ways that the staff at Growing Power would tell you that worms improve their aquaponics systems:

- **Cycling the system** – because the plants are introduced to the system in vermicompost they can be introduced immediately (and then fish two weeks later). Plus it seems to help cycle the system much more rapidly, probably because worms multiply bacteria by 13x inside their bodies.
- **Curing nutrient deficiencies** - If they see yellowing on the plants they just add another dose of vermicompost or compost tea. Plus, this makes up for a gap in fertiliser for the plants after a heavy fish harvest.
- **Fish health** – they are convinced that their fish have been healthier ever since they introduced vermicompost.

RICK MUELLER

In the midst of all of this is Rick Mueller, a quiet, unassuming but passionate man who runs the 190 000 litres of aquaponic systems that are responsible for half the produce harvested at Growing Power. What follows is an interview with Rick about how he came to be in charge of this incredible aquaponics setup, and what he sees for the future of aquaponics.



Over the Back Fence

Q: What brought you to aquaponics?

"I've worked in the aquarium industry all my professional life. I had my first fish tank at the age of ten and actually built my first aquaponics system at age fifteen. My first job offer was to build a fish room for a local pet store. That led me to a wholesale business in tropicals, which led me to opening a store in Milwaukee that sold pond and aquarium plants and supplies. That business was doing very well, until the 2001 recession hit and people stopped putting ponds into their backyards."

Q: How did you and Growing Power connect up?

"In February, 2003, Growing Power called and wanted to know if I was interested in buying some extra water lettuce and water hyacinth that they had on hand."

Q: Wait a minute...those are water plants, not food. Really?

"Yes. Back then Growing Power wasn't only growing food. They have changed a lot since then. Anyway, they were growing huge water lettuce and water hyacinth, much better than I could get in Florida, and they were using them to filter their fish tanks and selling them as a side business. Soon after that call I lost the lease on my shop and asked them if they would be interested in my equipment. They asked me if I wanted to come to work for them and I've now been there for seven years."

Q: How were you inspired to start growing food plants?

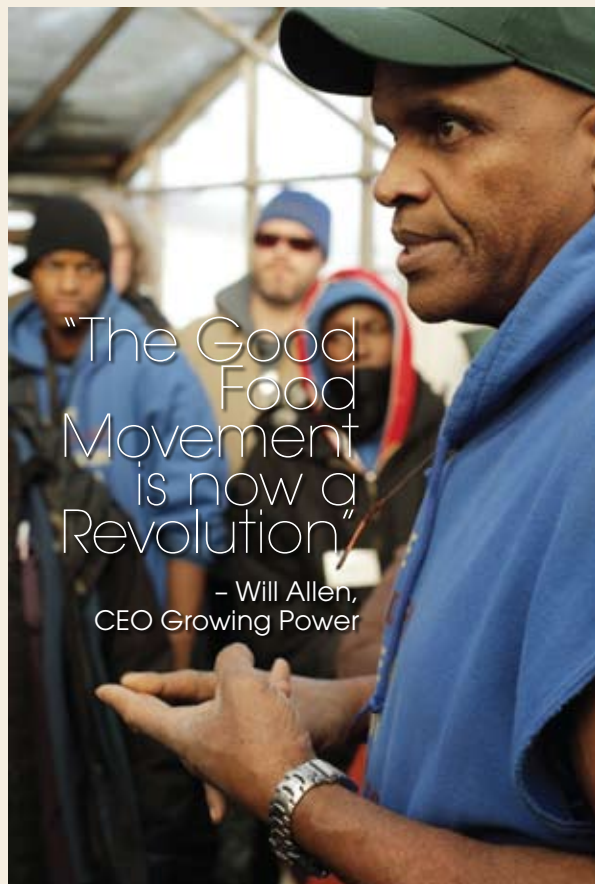
"Will Allen is the inspiration for everything that happens at Growing Power, but nothing happens on its own – everything is a team effort. We have gone through many changes with this system, including growing strawberries, but now we grow only salad greens and watercress, not even any tomatoes or peppers."

Q: How much of the output from Growing Power is grown using aquaponics?

"Approximately 50% of the produce grown at the main facility in Milwaukee, is grown using aquaponics."

Q: What does your average day look like?

"I do two rounds a day when I visit every system – first thing in the morning and before leaving in the evening. I start at one end of the building and check that the pumps are running; the fish are happy, etc. Then during the day, I keep an eye on all the systems, fix problems, and think about how we are going to go from 190 000 litres of systems to 265 000 litres, which is our next goal."



Q: What do you think the future of aquaponics in the U.S. is?

"Aquaponics is growing by leaps and bounds, in part because the government is now regulating aquaculture discharge and there is such a focus now on conserving resources."



Q: What possible obstacles do you see to the future growth of aquaponics?

"I see a couple. Because it isn't a familiar growing technology, people are reluctant to make an investment in it. This will slow down the growth of commercial aquaponics. I also see an issue with beginners being overly optimistic and investing too much into a big system to start

with rather than starting small, learning and growing over time."

Q: What advice do you have for newcomers to aquaponics?

"I found when I ran my store that there were two kinds of customers:

1. The ones, who were successful, would ask for advice on building a pond and

maybe buy a book in the process.

2. Then there were those who came in and asked for a book on building a pond. And another book. And they just kept reading books rather than getting their feet wet. They would get more and more scared about the complexity."

"My advice is to put the shovel in the ground and just do it." ●



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Work is well under way on the **tenth edition** of the magazine. We will continue to showcase systems belonging to members of the online discussion forum, there will be information on vegetables and plants well suited to aquaponics systems, plus lots of useful hints and tips.

It's promising to be an exciting issue, packed full of information.

**Issue 10
OUT
SOON**

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